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ABSTRACTS OF THE PHYSICO-CHEMICAL LITERATURE IN JAPAN

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No. 2

1—GENERAL

Micro method for the rapid determination of specific gravity. T. Gesi. *Okayama-Igakkai-Zasshi*, 55, 3, 429~436 (1943).—The method here described is an improvement of that developed by Lindstrom-Lang, Lanz and Jacobsen (1938, 1940). A reasonably linear specific gravity gradient is produced in a vertical measuring cylinder by mixing kerosene and bromobenzene, or benzene and chloroform in varying proportions. In kerosene-bromobenzene mixts. the position of a drop is detd. after the drop (diameter 2.0 mm) has fallen for 30 sec. Plotting the positions of drops of known solns. of sodium chloride as ordinates against the corresponding specific gravities as abscissae, a nearly straight line is obtained in a coordinate system, from which it is possible, knowing the position of a drop to read the specific gravity of the soln. with considerable accuracy. The reading of the positions of drops may be made with the naked eye making use of two leaves of section paper, which are stuck on the wall of measuring cylinder. The eye is kept at the level of the drop and the same positions of two scale divisions, in order to eliminate errors due to parallax. In benzene-chloroform mixts. the drops fall more rapidly, and come to rest much faster, so that the infusion of the mixts. into the drops will be minimized. At the const. temp. it is not advisable to use kerosene-bromobenzene mixts. for more than 1 hour at one expt., and to use benzene-chloroform mixts. for more than 2 hours. Therefore, benzene-chloroform mixts. are more suitable than kerosene-bromobenzene mixts. for the detn. of specific gravity. Its accuracy is 0.1 per cent.

Author.

The method of measuring the thickness of the film coating the metal surface by X-rays. S. Simizu. *Simazu Hyoron*, 3, 2-5 (1942).—By radiating X-rays on the polyhedral crystal surface of metal coated with a compd. film, are formed two different diffraction halos: the halo of the metal itself and that of the film whose intensity is different according to the thickness. From this phenomenon, the relation between the thickness of the film and the intensity of diffraction halo is derived. This relation is applied to the measurement of the thickness of silver coated with silver chloride.

J. C. L.

The effect of temperature and moisture on the dispersion coefficient of the ions in the air. K. Ogasawara. *Bull. Phys. & Agri. Dep. Taihoku Imp. Univ.*, 18, 167-183 (1936).—The dispersion coeff. of the ions in the air within the thermostat (temp. -15° to $+15^{\circ}$; vapour press. 1~32 mm.) is measured by means of the capillary flow method revised from the Townsend method. The ions show different characteristics according to the different elect. charges. The phenomena can explain the formation and nature of lightning and thundercloud.

J. C. L.

The balance of the ions in the air over the sea. K. Hakutyo. *Bull. Phys. & Agri. Dep. Taihoku Imp. Univ.*, 10, 175-201 (1934).—With respect to the neutralization of positive and negative ions and taking account of the number of ions and that of various kinds of the nuclei present in the air, the velocity formula of the disappearance of ions is derived. Using the numbers of ions measured by some investigators at many

places on the Pacific and the Atlantic, the number of the nuclei at respective places can be measured from this formula. J. C. L.

The thermionic emission of semi-conductors. T. Hibi. *Nippon Subutukaisi*, 17, 16-22 (1943).—The thermionic emission of semi-conductors such as BaO and SrO was numerically calcd. under various conditions by the generalised Blewett's formula. It has been confirmed that there exists the positive temp. coeff. of work function. The smaller is the active energy, the greater is the temp. coeff. of work function. The work function given at a temp. of 0°K corresponds to that measured by the Richardson-line method. Author.

Empirical equations for calculating the changes in the boiling points for small changes in the pressure of some of the organic substances. R. Negisi. *This Journal*, 17, 85-102 (1943).

The state of dispersion of sparingly soluble liquid in water. 1. The determination of concentration of i-amyl alcohol in water. S. Mitui and T. Sasaki. *J. Chem. Soc. Japan*, 63, 1766-1771 (1942).—A new sensitive method of detg. the concn. of a solute in soln. is indicated and is applied to the measurement of the solubility of sparingly soluble organic liquids such as i-amyl alcohol in water. The method is based on the following principles. The solubility (S) of butyl alcohol in water is markedly decreased by the presence of a minute amount (C) of a higher homologue, such as i-amyl alcohol. It may be expressed as $C=f(S)$. Now we can calc. the concn. of i-amyl alcohol in a soln. by the detn. of S, provided that the above function was known expl. The values C were detd. by the measurement of the volume of butyl alcohol added to the aqueous i-amyl alcohol solns. of known or unknown concn., till the turbid solns. were obtained.

The value thus obtained for the solubility

of i-amyl alcohol in water is 3.003 ± 0.0035 g. at $19.14 \pm 0.02^\circ\text{C}$. Authors.

Monovinylacetylene. K. Omura. *Mazda Kenkyuziho*, 17, 83-88 (1942).—The vapour press. of a monovinylacetylene-xylol soln.: Desired concns. (4-35%) of monovinylacetylene-xylol soln. were prepared under cooling with liquid air. The total vapour press. of those solns. obtained are measured at 5, 10, 15, and 20°. The observed values are proportional to the molar fraction of the solvents, and hence of the partial vapour press. of monovinylacetylene. The liquefaction of monovinylacetylene under press. From the curve expressing the change of the volume by press. are obtained both the press. which starts the liquefaction and that which completes it. J. C. L.

The influence of atomic hydrogen upon the oxide cathodes. Y. Tamura, H. Yamamoto and T. Hukase. *Tosiba-ken.*, 18, 4, 189-196 (1943).—The oxide cathodes are low temp. sources of copious electrons and used generally in commercial vacuum tubes. But owing to their sensitivity to exhausting conditions, it is not seldom that some of these cathodes exhausted and activated under apparently the same conditions, show low emissions. This presents a fatal difficulty for mass production and many efforts have been made in vain to solve this problem. We carried out an expt. on the influence on the oxide cathode of atomic hydrogen created by an electrodeless discharge in a high frequency field from hydrogen molecules out of the plate, which had been fired in a hydrogen furnace before mounting and was heated by a high frequency furnace on exhausting. The results obtained show that the atomic hydrogen lowers the activity of cathode at relatively low temp., but the low emission is only temporary and it can be recovered, for example, by a heat treatment of the cathode at a high temp. for a few minutes. The assumption is made that the hydrogen atoms which damage the

active centres at low temps. combine with oxygen atoms in the oxide lattices and evaporate as H_2O molecules resulting in the recovery of activity by heat treatment at a high temp. Authors.

The crystal structure and electric properties of long chain compounds. I. Y. Kakiuti. *Sc. P.*, 40, 189-200 (1943).—Certain long chain compds. and their mixts., solidified from their melts under an electric field, were found to release a considerable amount of the electric charge, when they are warmed again. Pure paraffins, acids and esters produce no current, but alcohols, halides, amides as well as acid-paraffin, acid-ester, and alcohol-ester mixts. produce discharging currents. As proved by X-ray studies, microcrystals orientate themselves under the electric field. If such crystalline aggregates are heated, the arrangement of the microcrystals would become disordered. When the crystal has a permanent dipole moment, the resultant moment is largest when the arrangement is perfect, and becomes smaller as the arrangement becomes disordered. Such a change of electric moment induces the electric charge on the electrodes of the condenser, and continual change of the crystal arrangement thus produces a current through the closed circuit. This view is strongly supported by the fact that the present effect is not observed in the case of paraffins, acids and esters, whose crystals are thought to have no electric moment from our knowledge of their crystal structure. On the contrary, microcrystals of alcohols, halides and amides may have permanent dipole moment, and they produce the electric current in the above expts.

Author.

Interpretation of the anomaly in the optical activity of oxy-acids. I. Tartaric acid. Y. Tsuzuki. *J. Chem. Soc. Japan*, 64 282-9, (1943).—The author thinks that the total rotation of α -oxy-acids is the sum of the partial rotations due to the OH group and to the re-

sidual part of the molecule, esp. its COOH group. Although the COOH group absorbs deeper than the OH group in the ultraviolet region, its contribution to optical activity is rather smaller than the latter, since the OH group is situated nearer to the asymmetric centre. Consequently the total rotation is controlled chiefly by the partial rotation of the OH group; and in oxy-acids of *d*-series, OH group contributes to the dextro partial rotation. On this view, the anomalous rotatory behaviours in tartaric acid—variations in the rotation by temp., solvent, concn.—can be satisfactorily explained. **II. Malic acid and lactic acid.** *ibid.*, 290-8. It is demonstrated that the anomaly in the optical activity of malic and lactic acids and of their various derivatives can be rationally interpreted on the basis of the principle as applied in the interpretation of the optical anomaly in tartaric acid. It is concluded that sarco-lactic acid is to be called *L*-lactic acid in its true physical meaning. The concn.-temp. influences have been investigated on the rotation of zinc ammonium *d*-lactate in aqueous soln., and the influences of solvent, temp. as well as concn. on the rotation of ethyl *d*-lactate have been measured. It is shown that ethyl lactate as well as ethyl malate has abnormal molecular weights in some solvents. Author.

The kinetics of the reaction between ammonia and carbon dioxide. T. Yosida. *Bull. Inst. Phys. Chem. Research*, 21, 946-979 (1942).—The dissocn. press. of ammonium carbamate being measured, the kinetics of the formation of NH_3 and CO_2 is studied. The reaction velocity is the function of the size of the walls and the dryness of the walls, and the mixing ratio of the reacting gases. When the wall is highly dried because of high temp. and one of the reactants is in excess, the induction period and autocatalysis are observed, and the reaction stops halfway. The reaction velocity has a negative temp. coeff. and the apparent activated energy is negative, being 8 Cal. at

$-33 \sim 0^\circ$ and 6.5 Cal. at room temp. $\sim 40^\circ$. From these results it is inferred that the reaction is caused by the reacting gaseous molecules at the adsorption layer on the walls of the reaction vessel; various kinetic phenomena are explained by the Langmuir adsorption isotherm. In the present experiment it is ascertained that the effect of a trace of water on the reaction is produced by water present on the reaction walls rather than by water in the gaseous phase.

J. C. L.

The effect of organic substituents on reactivity. I. Theoretical considerations on substituent effect. T. Ri. *This Journal*, 17, 3-15 (1943). **II. The orientation effect in mono-substituted benzenes.** *ibid.*, 17, 16-31 (1943). **III. The theory of acid strengths of substituted acids.** *ibid.*, 17, 32-47 (1943).

2—SUB-ATOMICS, RADIOCHEMISTRY AND PHOTOCHEMISTRY

The relaxation of the cybotactic structure of amorphous solids and the mechanism of formation of crystal nuclei. U. Yosida. *Mem. Coll. Sci. Kyoto Imp. Univ. Japan*, A, 24, 1-19 (1942).—The softening range of amorphous solids is considered to be the temp. range in which the relaxation of the cybotactic structure of the substances takes place. By applying van't Hoff's reaction-isochore to the cybotactic equil. in the supercooled liquid state of glycerol, ethyl alcohol and *dl*-lactic acid, the general tendency of the contribution of the effect of cybotactic decompn. to the temp. dependence of the specific heats of these substances in this state was examined. When the number of constituent molecules of a cybotactic crystal becomes infinite, a sharp and well defined temp. is found, below which some cybotactic crystals, but above which none can exist as such. This well defined temp. is the highest at which the crystal

nuclei can be formed in equil. and it is designated as the melting point of the substance. Regarding the relation between the latent heats of fusion of the monoatomic elements and their melting points, rather satisfactory explanation is proposed.

Author.

The compressibility of solid elements as expressed in terms of their melting points and atomic volumes. U. Yosida and Y. Masui. *Mem. Coll. Sci. Kyoto Imp. Univ. Japan*, A, 24, 29-36 (1942).—The compressibility of solid elements is found to be expressed approximately in terms of their melting points, atomic volumes and atomic numbers by an empirical formula, which is more reasonable than that proposed by Richards.

Authors.

The corresponding temperature of liquid elements and its bearing on the melting points and the T_2 points. U. Yosida. *Mem. Coll. Sci. Kyoto Imp. Univ. Japan*, A, 24, 37-53 (1942).—From Trouton's rule of the approximate proportionality between the latent heat of vaporization L_v per gram molecule of the elements and the normal boiling point T_b expressed in the absolute temp. scale, the mean value of the ratio L_v/T_b was found to be 27.4 cal per degree. The temp. $T_{c.b.p.}$ obtained by dividing the observed value of L_v of an element by 27.4 is called the corresponding boiling point of the element, which is somewhat different from the normal boiling point. Relying upon Young's formula for the satd. vapour press., the ratio of the vapour press. at the corresponding boiling point of a liquid to that it would have to acquire at infinitely high temp. becomes the same for all substances. By plotting in a graph the correlation among the corresponding boiling points the melting points and the T_2 points of monoatomic elements, the correspondency of the state of different elements and the unaccordance of their melting points with any simple energy law were investigated.

Author.

Optical rotatory power and circular dichroism. II. Absorption, circular dichroism, and rotatory dispersion of ammonium α -bromocamphor- π -sulphonate. M. Kobayasi. *J. Chem. Soc. Japan*, **64**, 129-134 (1943).—The article deals with the method of detg. circular dichroisms in the visible and the near ultraviolet regions by utilizing the previously reported apparatus for measuring optical rotatory dispersion. The light absorption, circular dichroism and rotatory dispersion of ammonium α -bromocamphor- π -sulphonate were measured, and compared with the calcd. values based on Kuhn's theory on the relation between rotatory dispersion and light absorption. Author.

Optical rotatory power and circular dichroism. III. Rotatory dispersion of d-[Co en₃]Br₃. M. Kobayasi. *J. Chem. Soc. Japan*, **64**, 648-653 (1943).—The observed molecular rotation of d-[Co en₃]Br₃ was analyzed into the partial rotation associated with the first absorption band and the residual rotation by means of Kuhn's theoretical equation of the rotatory dispersion, utilizing the observed values of light absorption and circular dichroism. The following equation was obtained for the spectral region between 666 m μ and 282 m μ for aqueous soln. of d-[Co en₃]Br₃.

$$[M] = \frac{3210^\circ}{0.541} \cdot \frac{\nu}{57.3} \left[e^{-\left(\frac{61.1-\nu}{4.22}\right)^2} - \int_0^{\frac{61.1-\nu}{4.22}} e^{x^2} dx - \frac{4.22}{2(61.1+\nu)} \right] - \frac{2303\nu^2}{119^2 - \nu^2}$$

The contribution of the second absorption band to the rotatory power of the complex salt was found to be very small compared to that of the first band. This fact is explained by Tsuchida's theory of absorption bands in the coordination compds.

Author.

A spectrographical study of the inflammation in the cylinder of a motor. S. Awano, T. Kawamura, and K. Nakajima. *Bulletin of Aeronautical Research*, **18**, 267-287 (1942).—Using several kinds of

fuel under various conditions, the spectra of the flame in a cylinder are photographed and qualitatively compared with one another. The spectra taken are all similar to those of the flame of the Bunsen burner. The oxidation reaction finishes and the band spectra, such as C₂(Swan) and CH, appear at the outer part of the flame, while in the after glow only a continuous spectrum of CO, CO₂, and O₂ is observed. In the case of normal inflammation, decrease in the intensity of the bandspectra is in the order of *i*-propylether, *i*-octane, toluol, pinacolin and *n*-heptane and there is no decrease in methanol. In other words, the larger the octane value the higher the intensity except in the case of methanol. When the power of a motor is highest, the excess ratio of the air being about 0.9, the band spectra appear most clearly. In the case of the fuel whose molecule has the oxygen atoms the change of the intensity is less than that having no oxygen atoms. Excessive supply of 0~220 mm. scarcely affects the spectra so long as there occurs no knocking. With highly excessive supply the intensity of the band spectra is somewhat decreased, but that of the continuous spectrum is increased. In the case of knocking, such band spectra as C₂ and CH disappear; the continuous spectrum extends to both the long and the short wave-length parts; the temp. of the flame is extremely high; the black body radiation is observed. These facts suggest that there occurs the oxidation inflammation whose mech. is quite different from that of normal inflammation. J. C. L.

3—ELECTROCHEMISTRY AND THERMOCHEMISTRY

The relation between the effects of anti-spray oil layers on the performance of secondary cells and the charging rate. M. Sinohara, H. Yamamoto. *Bull. Electrotech. Lab.*, **7**, 5, 271-274 (1943).—As the result of the expts. repeated on 200 cycles, it is shown that the harmful effects of

oil layers on the performance of secondary cells are in proportion to the charging rate of the cells. The use of oil layers is therefore very disadvantageous if overcharging occurs consistently as in the batteries of telephone offices. Authors.

On ionization constants of silicic acid and reaction of sodium metasilicate with various metallic ions. Y. Oka, K. Kawagaki and R. Kadoya. *J. Chem. Soc. Japan*, **64**, 718-722 (1943).—I. Solns. cont. known amounts of sodium metasilicate are titrated with hydrochloric acid using hydrogen electrode as indicator. From the P_H values of each point on the titration curves, $K_1 = 3.1 \times 10^{-10}$, $K_2 = 1.7 \times 10^{-12}$ are obtained as primary and secondary ionization consts. at 25°C. II. Solns. of Cu, Ag, Mg, Ca, Sr, Ba, Zn, Cd, Al, Pb, Cr, Fe, Co and Ni salts are titrated with fresh sodium metasilicate soln. using glass electrode. Sodium metasilicate soln. is unstable and the compn. differs according to the time kept. Authors.

On the thermal conductivity of macromolecular substances. V—VI. C. Matano. *J. Soc. Chem. Ind. Japan*, **46**, 459-463 (1943).—V. Effect of water content and temp. upon the thermal conductivity of natural and artificial silk: The thermal conductivities of various silk fabrics—natural and artificial—of packing coeff. about 50% and of water content 0 to 35% at the temp. of 20° to 40°C were measured with the apparatus described in part I of the present reports. The results are as follows: (1) The thermal conductivity slightly increases with the elevation of temp. (2) The increase of thermal conductivity for 1% increase of water content is about 4% for natural silk and is about 2.5 to 3.5% for artificial silk. (3) The thermal conductivity of artificial silk is about 1.23 times greater than that of natural silk under the same conditions. (4) As it is shown in parts 4 and 7 of the present reports (*Öyöbuturi*, **11**, 315 & 578 (1942)), the thermal conductivity of artificial silk fabrics

under great press. has a linear relation to the packing coeff. from 0 to 100%. In this case also, the measured values are on the same line, and from the results at 30°C, we get 0.00037 cal./cm. sec. deg. as the thermal conductivity of dry natural silk itself. VI. Thermal conductivity of some polyvinyl-compds.: In this case all the samples were measured in the form of films with the apparatus used in the previous expts. The results at 30°C are as follows: (1) The thermal conductivity in cal./cm. sec. deg. is 0.00052 for polyvinylacetate; 0.00042 for copolymer of vinyl-acetate and -chloride (1:2); 0.00040 for copolymer (1:4). (2) The thermal conductivity is 0.00073 for polyvinyl-alcohol in dry state and 0.00041-0.00054 for partially acetylated one. The rate of its increase for 1% increase of water content is about 1% for the former and about 2-4% for the latter. (3) The thermal conductivity of polyvinylbenzene is 0.00038 cal./cm. sec. deg. Author.

Vapour pressures of molecular crystals. IV. The vapour pressure of iodoform and the calculation of sublimation heats for some other molecular crystals. I. Nitta and S. Seki. *J. Chem. Soc. Japan*, **64**, 475-482 (1943).—Using the same method as given in the previous reports the vapour pressure of iodoform in solid state was detd. It could be represented by the following equation: $\log P_{\text{mmHg}} = -3650.0/T + 9.1317$. From this, some thermodynamical quantities were deduced. The comparisons with the theoretical calcns., of the sublimation heats obtained by the authors have also been attempted for several molecular crystals; viz: SnI_4 , TiBr_4 , PaBr_3 , CHI_3 and I_2 . The theoretical calcns. were carried out by use of the approximations of Slater-Kirkwood and London on the van der Waals energy. It was found that these theoretical values were always greater than the observed ones by about 10 percent. In the case of the iodine crystal the repulsive and Mar-

genau's energies were especially computed and it was shown that those two energies nearly compensated one another. Thus, the use of London's and Slater-Kirkwood's methods may be of practical significance to estimate the lattice energy of these molecular crystals having somewhat complicated lattice structure. Authors.

On the vapour pressure of bromine in bromine water. H. Hagiawa and T. Oikawa. *Bull. Inst. Phys. Chem. Research*, 22, 287-292 (1943).—Vapour press. of bromine in bromine water have been measured at 25, 40, and 55° by the dynamical method. Concns. of bromine molecules have been calcd. by taking into account the hydrolysis and the formation of Br_3^- , and Henry's law can be expressed as follows:

$$[\text{Br}_2] = 0.0009p \quad (25^\circ\text{C})$$

$$[\text{Br}_2] = 0.00049p \quad (40^\circ\text{C})$$

$$[\text{Br}_2] = 0.000261p \quad (55^\circ\text{C})$$

where $[\text{Br}_2]$ is expressed in mols per l and p in mm Hg. The following values have been obtained:

$$\text{Br}_2 (\text{aq. } a=1) = \text{Br}_2 (\text{g. } 1 \text{ atm});$$

$$\Delta F_{298}^\circ = -193 \text{ cal.}$$

$$\Delta S = 28.6.$$

$$\Delta H_{298}^\circ = 8333 \text{ cal.}$$

$$\text{Br}_2 (l) = \text{Br}_2 (\text{aq. } a=1); \Delta F_{298}^\circ = 948 \text{ cal.}$$

Authors.

4—COLLOID CHEMISTRY AND SURFACE CHEMISTRY

Super-heated sol of aluminium hydroxide. T. Katurai and T. Kita. *Se. P.*, 40, 68-71 (1942).—A highly stable sol is obtained from aluminium hydroxide contg. a small quantity of chlorine ion by heating it at 190° under a certain press. for 1 hour. The stability seems unaffected by the chlorine present in the sol. From the observation of its elec. migration by means of the U-tube method it is found to be a sol of positive colloid, mutually coagulating a colloidal soln. of arsenic sulphide. The stability of the sol

fluctuates by freezing. When iron hydroxide is heated alone under press., no sol can be formed due to the coagulation. On the other hand if it is heated with the equal amount of aluminium hydroxide, a stable red-brown sol is formed. J. C. L.

Studies on the zinc catalyst. I. On the methanol decomposition capability of the zinc catalyst starting from the zinc complex salt. A. Tomita, S. Watanabe, and R. Abe. *J. Chem. Soc. Japan*, 64, 423-430 (1943).—The complex zinc ion, $\text{Zn}(\text{NH}_3)_4^{++}$ was prepd. by dissolving the zinc hydroxide pptd. by 2.5N NH_4OH from a nitrate soln. with 33% ammonium soln. From the resulting soln., the catalyst was pptd. out by addn. of ethyl alcohol. It was washed and dried at 100°C. This zinc catalyst for the decompn. of methanol was found by far more active than the usual types of catalysts. This catalyst, after the decompn. of methanol, was photographed by x-rays, and its crystals were found to be very much smaller. It can be assumed, by this formation of smaller crystals, that a greater number of points of imperfection and of unsatn. are formed in the crystal lattice which may account for the greater activity of the catalyst. It can also be assumed, from the fact that the catalyst contains but 1.85% of ammonia while as $\text{Zn}(\text{NH}_3)_4^{++}$ ion it amounts to 40.63%, that the catalyst formation from the complex ion is due to a sudden release of the four molecules of ammonia from it. The contribution of the sudden change in the size of crystals to the unusual activity of the catalyst thus prepd. is treated qualitatively from several aspects. Authors.

Studies on the zinc catalyst. II. On the effect of the starting salts and precipitants on the zinc precipitated catalysts. A. Tomita. *J. Chem. Soc. Japan*, 64, 431-437 (1943).—The activity of a pptd. catalyst depends generally on the starting salt and precipitant. The zinc catalysts, used for the decompn. of methanol,

were prepd. by adding to the aqueous solns. (30 cc of water contg. about 1g of zinc) of inorganic zinc salts or of organic acid salts 1.5 times the amount of 2.5N alkali soln. at room temp. under const. stirring. The resulting ppts. were boiled for a short time, filtered, washed, and then dried at about 105°C. As starting salts, the chloride has been found to have somewhat harmful effects on the activity, while the sulfate, nitrate, and acetate have shown to be beneficial. The effects of precipitants have been investigated, using zinc nitrate as a starting salt. The order of their effectiveness has been observed to be as follows: $\text{KHCO}_3 > \text{NaHCO}_3 > \text{K}_2\text{CO}_3 > \text{NaCO}_3 > (\text{NH}_4)_2\text{CO}_3 > \text{KOH} > \text{NaOH} > \text{NH}_4\text{OH}$. While there is not appreciable difference in the effects of K, Na, and NH_4 of the carbonate and bicarbonate salts, the difference of the hydroxide salts is marked, and NH_4 is much less effective than either K or Na. This marked effect is probably due to the adsorption of a small amount of the ions. X-ray patterns of the 4 catalysts, pptd. respectively by K_2CO_3 , $(\text{NH}_4)_2\text{CO}_3$, KOH, and NH_4OH , were taken after they were used for the decompn. of methanol. As the results of x-ray analysis, the former two give more diffused Debye-rings, and they seem from the results of the

intensity curves, to possess smaller crystals and at the same time indicate an increase in the number of imperfect crystal lattices over the latter two catalysts. This increase in the number of imperfect crystal lattices and their unsatd. states probably account for the greater activity of the catalysts. Author.

Japanese acid clay. III. Activated clay. K. Mitui and T. Iijima. *Report of the Japanese Naval Fuel Depot*, 162, 1-8 (1943).—The Japanese acid clay activated by the mineral acid was investigated. The clay generally increases its base exchange capacity by the acid treatment, but some kinds of the clay, do not increase the catalytic activity for the formation of ether from ethanol. By the X-ray diffraction it was considered that the structure of the clay is not changed by the acid treatment. On the other hand, the soluble silica was shown to be increased by the chemical analysis. The dehydration curve by heating was also investigated by means of thermo-balance. Authors.

Physico-chemical studies on copper catalyst. I. The kinetics of the reduction of cupric oxide by hydrogen. 1. S. Hasegawa. *This Journal*, 17, 49-65 (1943).